

EQUIPMENT CERTIFICATE

| | | | |
|------------------------------|------------|--------------|-----------------|
| Certificate No.: | Issued: | Valid until: | GCC class |
| TC-GCC-DNVGL-SE-0124-07241-0 | 2021-04-23 | Unlimited | TC _i |

Issued for:

PV Inverters SUN2000-2KTL-L1, SUN2000-3KTL-L1, SUN2000-3.68KTL-L1 (PPM Type A)

With specifications and software version as listed in Annex 2

Manufacturer:

HUAWEI Technologies Co., Ltd

Bantlan, Longgang District,
Shenzhen 218129, P.R. China

Customer:

HUAWEI Polska Sp.z.o.o.

Horizon Plaza Building, Domaniewska 39A
Street, 02-672 Warsaw, Poland

According to:

DNVGL-SE-0124, 2016-03: Certification of Grid Code Compliance

PTPIREE, 2020-03: Conditions and procedures for using certificates in the process of connecting power generating modules to power networks

32016R0631, 2016-04: Requirements for Generators (NC RfG)

PSE, 2018-12: Requirements of general application resulting from Commission Regulation (EU) 2016/631 of 14 April 2016

detailed in Annex 1

Based on the document:

CR-GCC-DNVGL-SE-0124-07241-A072-0 Network Code Requirements for a PGM of Type A - Poland, Certification Report, dated 2021-04-23

Further assessment information, including scope and conditions, is found in Annex 1. Description of the PV inverters and type tests performed is found in Annex 2 and Annex 3 respectively.

Hamburg, 2021-04-23

For DNV Renewables Certification

Hamburg, 2021-04-23

For DNV Renewables Certification



Bente Vestergaard

Director and Service Line Leader Type
and Component Certification

By DAkKS according DIN EN IEC/ISO 17065
accredited Certification Body for products. The
accreditation is valid for the fields of certification
listed in the certificate.

Liselotte Ulvgård

Project Manager

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Conditions, assessment criteria and scope of assessment

Provided that the conditions listed in section 1 are considered at project level, the PV inverters as further specified in Annex 2 comply with the requirements within scope of this certification, as specified in section 3.

The customer, as specified on the front page of this certificate, is responsible for the certificate maintenance.

1 Conditions

- Changes of the system design, hardware or the software of the certified PV inverters are to be approved by DNV.
- Inverter settings must finally be agreed and checked at project level to ensure full grid code compliance, based on the requirements of relevant System Operator (SO). For the functionalities within scope of this certification, more information about the settings assessed is found in section 4.2 and sections 5.1-5.4 of the certification report CR-GCC-DNVGL-SE-0124-07241-A072-0.
- To ensure a compliant LFSM-O characteristic, the correct reference power for droop calculation must be used, either by using the EN50549-PL parameter set (as can be chosen as “grid code” in control interface) or by manual parameter adjustments, which is not further described in this report and needs to be assessed on project level. More information is found in section 4.2 and 5.5 of the certification report CR-GCC-DNVGL-SE-0124-07241-A072-0.

2 Assessment criteria and normative references for this certificate:

- /A/ Service Specification DNVGL-SE-0124: Certification of Grid Code Compliance, DNV GL, March 2016
- /B/ Conditions and procedures for using certificates in the process of connecting power generating modules to power networks, Warunki i procedury wykorzystania certyfikatów w procesie przyłączenia modułów wytwarzania energii do sieci elektroenergetycznych, version 1.1, PTPiREE, dated 2020-03-20, (in the following: PTPiREE 2020-03)
- /C/ Requirements of general application resulting from Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (NC RfG) – as approved by the decision of the President of the Energy Regulatory Office DRE.WOSE.7128.550.2.2018.ZJ dated January 2nd 2019, Wymogi ogólnego stosowania wynikające z Rozporządzenia Komisji (UE) 2016/631 z dnia 14 kwietnia 2016 r. ustanawiającego kodeks sieci dotyczący wymogów w zakresie przyłączenia jednostek wytwórczych do sieci (NC RfG), PSE S.A., dated 2018-12-18 zatwierdzone Decyzją Prezesa Urzędu Regulacji Energetyki DRE.WOSE.7128.550.2.2018.ZJ z dnia 2 stycznia 2019 r, (in the following: PSE 2018-12)
- /D/ Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators, published in the Official Journal of the European Union L112/1, The European Commission, 27/04/2016. Document 32016R0631, (in the following: NC RfG)

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3 Scope of assessment and results

The following functionalities have been assessed based on the rules for the use of equipment certificates for Power Park Modules (PPMs), as specified in chapter 7 and 9 of the PTPIREE 2020-03 /C/. The functions denoted “Not Applicable” in the table of chapter 7 has not been included.

| Capability | NC RfG /D/ | PSE 2018-12 /C/ | Type A | Assessment result |
|---|------------|--------------------|--------|-------------------|
| Frequency range | 13.1 (a) | 13.1 (a)(i) | x | Compliant |
| Rate of Change of Frequency (RoCoF) withstand capability, df/dt | 13.1 (b) | 13.1 (b) | x | Compliant |
| Remote cessation of active power | 13.6 | 13.6 | x | Compliant |
| Limited Frequency Sensitive Mode – Over Frequency (LFSM-O) | 13.2 | 13.2 (a), (b), (f) | x | Compliant |

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Schematic description and technical data of the generating units

1 Schematic description of the generating unit

The Huawei solar inverter family L1, consisting of: SUN2000-2KTL-L1, SUN2000-3KTL-L1, SUN2000-3.68KTL-L1 convert electrical energy generated by photovoltaic modules (DC) to single -phase alternating current (AC).

They run at 230 V rated output voltage with a rated active power output of 2 kW to 3.68 kW. The different output power variants are achieved through derating via software. There is no further difference in the hardware or firmware used.

The electrical data of the generating unit is summarized in the following section.

2 Technical data of main components

According to the documents provided by the manufacturer, the following components are used.

2.1 General Specifications

| Generating Unit | SUN2000-2KTL-L1 | SUN2000-3KTL-L1 | SUN2000-3.68KTL-L1 |
|-----------------------------------|-----------------|-----------------|--------------------|
| No. of phases | 1 | 1 | 1 |
| Rated apparent power | 2 kVA | 3 kVA | 3,68 kVA |
| Rated active power | 2 kW | 3 kW | 3,68 kW |
| Rated AC-voltage (phase to phase) | 230 Vac | 230 Vac | 230 Vac |
| Rated frequency | 50 Hz | 50 Hz | 50 Hz |

2.2 DC Input

| | |
|-----------------------|--------|
| Min. MPPT voltage | 90 V |
| Max. MPPT voltage | 560 V |
| Max. DC input voltage | 600 V |
| Max. DC input current | 12,5 A |

2.3 Software Version

| | |
|------------------|--|
| Firmware version | V200R001 |
| Software version | V200R001.C00.SPC[x] for $[x] \geq 106$, provided that updates to [x] would not have influence on the electrical behavior that was tested for the certified features. Any other update would need to be approved by DNV to ensure validity of certificate |

2.4 Unit transformer

The transformer is not part of the generating unit and consequently has not been part of the assessment.

2.6 Grid Protection

The protection is not part of certification scope

2.7 Control settings

The control interface allows for the selection of different parameter sets, via the parameter "grid code", which provide default parameter settings. For this assessment the parameters set named "EN50549-PL" in the interface, was assessed for the functionalities within scope of this certification.

It should be noted that compliance can be achieved also with other parameter sets and control settings, but that changes to control settings will affect the inverter control behaviour which can thus affect compliance. Final settings must be agreed on project level in agreement with relevant system operator.

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Type tests

1 Type tests

Tests were performed from 2020-12-17 to 2020-04-30 in the Huawei Test Lab in Shenzhen by Bureau Veritas Test Lab in Shenzhen, for certification according to standard EN 50549-1:2019. All tests were performed under ISO-17025 accreditation and they were performed on the L1SUN2000-6KTL-L1 unit. This tested unit belong to the same inverter series as the certified variants, although it is not in scope for this certification, and thus not listed as part of the L1 family in Annex 2

The results used for assessment are documented in the measurement report(s) as specified below:

| Scope | Reference |
|---|------------------------|
| Frequency range | 4.4.2 and 4.4.3 of /1/ |
| Rate of Change of Frequency (RoCoF) withstand capability, df/dt | 4.5.2 of /1/ |
| Remote cessation of active power | 4.11.1 of /1/ |
| Limited Frequency Sensitive Mode – over frequency (LFSM-O) | 4.6.1 of /1/ |

| Measurement report(s) | Document number | Content |
|-----------------------|-----------------|---|
| /1/ | PVNL191217N030 | Requirements for generating plants of type A and B according to EN 50549-1:2019 |

The tests results have been assessed against the requirements of PSE 2018-12 /C/ and NC RfG /D/. Further details are described in the corresponding certification report CR-GCC-DNVGL-SE-0124-07241-A072.